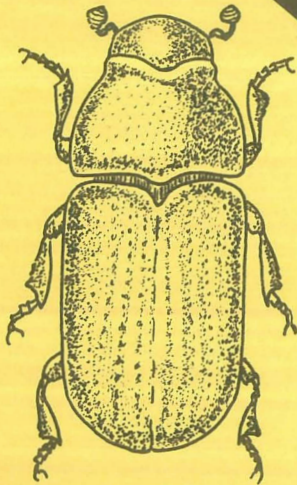


R-3 74-15

BIOLOGICAL EVALUATION
Western Spruce Dwarf Mistletoe

Fort Apache Indian
Reservation
Arizona

1974



Southwestern Region

U. S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE



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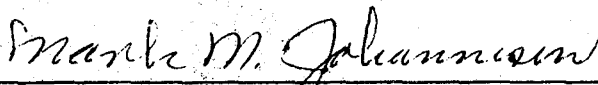


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INTRODUCTION

Western spruce dwarf mistletoe, Arceuthobium microcarpum (Engelm.) Hawks. and Wiens, is a locally important parasite of spruce in the Southwest. It infects both Engelmann spruce, Picea engelmannii Parry, and blue spruce, Picea pungens Engelm., but only in a restricted portion of their ranges in Arizona and New Mexico. The parasite is most abundant in Apache and Greenlee Counties of east central Arizona, where a limited roadside survey on the Fort Apache Indian Reservation indicated up to 70 percent of the spruce stands were infested. The parasite has also been found to be a primary factor associated with spruce mortality in heavily infested stands.

The area of abundant western spruce dwarf mistletoe coincides with the largest continuous Engelmann spruce forest in Arizona. The forest occupies about 45,000 acres in the White Mountains above 9,000 feet. While Engelmann spruce predominates there in pure stands, at the lower elevations it also occurs in mixed stands with blue spruce, corkbark fir, Abies lasiocarpa var. arizonica (Merriam) Lemm., Douglas-fir, Pseudotsuga menziesii var. glauca (Beissn.) Franco, and quaking aspen, Populus tremuloides Michx. Except for a limited amount of cutting and road building, the forest has remained undisturbed by the activities of man. For the past several years, an outbreak of the spruce beetle, Dendroctonus rufipennis (Kirby), has killed many Engelmann spruce there. The impact of this outbreak is being evaluated by the Forest Insect and Disease Management Branch, Region 3. Because western spruce dwarf mistletoe causes growth loss and mortality, knowledge of its occurrence throughout the residual spruce stands was considered essential for a complete understanding of stand recovery after the spruce beetle epidemic. This report evaluates the importance of A. microcarpum in Engelmann spruce stands on the Fort Apache Indian Reservation.

METHODS

The incidence of western spruce dwarf mistletoe on Engelmann spruce was recorded in 1973 while surveying for spruce beetle. The survey covered five major drainages of the White Mountains: Becker, Bonito, Ord, Paradise, and Smith Creeks. Observations were taken at 5-chain intervals along cruise lines spaced at 10-chain intervals in Becker and Bonito Creek drainages, and at 20-chain intervals in the other three drainages. Observation points falling in treeless areas were omitted. If dwarf mistletoe plants or the associated witches' brooms were visible from an observation point, the parasite was recorded as being present. The effective distance for detection of the dwarf

mistletoe varied with stand density. Because the witches' brooms caused by this species are small and dense and spruce often naturally produces dense branch growth, the presence of dwarf mistletoe plants on lower branches and understory trees was verified wherever questionable brooming was encountered.

The forest type and elevation of spruce dwarf mistletoe infestations were determined by superimposing an overlay of the observation points over timber type and topographic maps. Prominent terrain features were used as control points to properly align the overlay. Timber type maps, obtained from the Bureau of Indian Affairs, Whiteriver, Arizona, were used to delineate stands where spruce, spruce-fir, mixed conifer, and aspen each comprise more than 50 percent of the stems.

RESULTS AND DISCUSSION

Western spruce dwarf mistletoe was found on 3.4 percent of 2,350 observation points taken over 18,360 acres (Table 1). Its incidence was greatest in mixed conifer stands (Table 1) and at lower elevations (Table 2).

The percentage of observation points infested in the present survey might have been higher if the survey had covered a greater elevational range, and blue spruce had been included. This is supported by the fact that the previous survey, which reported 70 percent infection, was conducted at lower elevations primarily in blue spruce (personal communication, Dr. Frank G. Hawksworth, U.S. Forest Service, 1974).

The reported elevational range of western spruce dwarf mistletoe is 7,900 to 10,000 feet. Although the present survey extended into Engelmann spruce well above 10,000 feet, the parasite was found there only rarely (Figure 1). Less than 1 percent of the observation points above this elevation were infested, even though 60 percent of the observation points were taken there (Table 2). The elevation of the highest infested observation point was about 10,400 feet. The reasons for an elevational limit are unclear, but climatic extremes presently may be too severe at higher elevations for its survival.

Because western spruce dwarf mistletoe was not abundant in Engelmann spruce stands, it is expected to have little overall effect on stand recovery following the spruce beetle outbreak. However, the effect of dwarf mistletoe on stand recovery will have to be considered in the few areas where it was prevalent.

Table 1.--Western spruce dwarf mistletoe incidence on Engelmann spruce, by forest type, White Mountains, Fort Apache Indian Reservation, Arizona, 1973.

Forest type	Acreage surveyed	Observation points	
		Total No.	% infested
Spruce	10,735	1,374	1.8
Spruce-fir	4,039	517	4.8
Mixed conifer and aspen	3,586	459	6.8
Total	18,360	2,350	3.4

Table 2.--Western spruce dwarf mistletoe incidence on Engelmann spruce, by elevation, White Mountains, Fort Apache Indian Reservation, Arizona, 1973.

Elevation range (ft)	Acreage surveyed	Observation points	
		Total No.	% infested
9,000-9,500	1,424	135	11.9
9,500-10,000	5,738	787	7.1
10,000-10,500	7,697	1,014	0.9
10,500-11,000	3,137	372	0.0
Above 11,000	364	42	0.0
Total	18,360	2,350	3.4

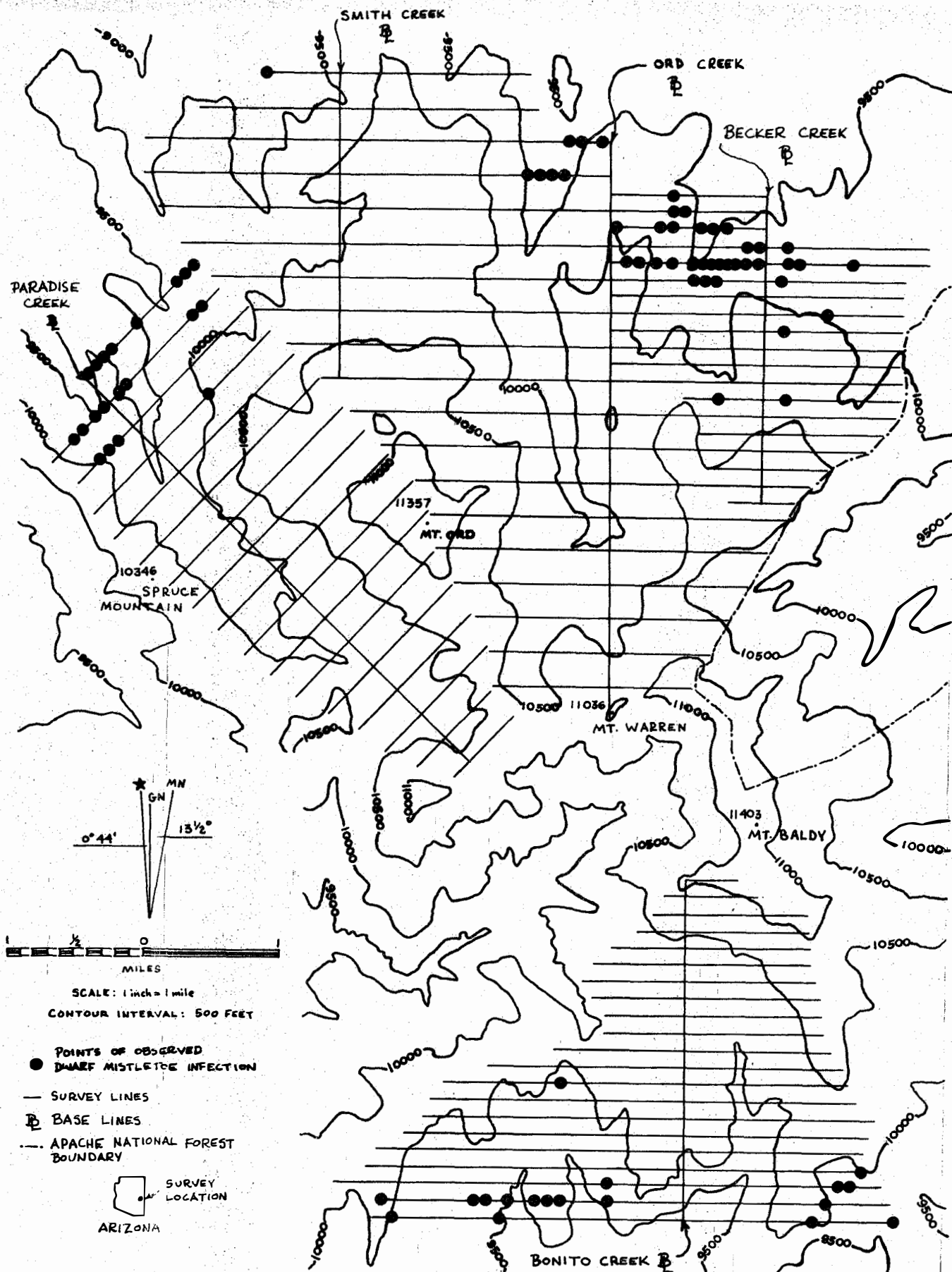


Fig. 1.--Observed distribution of western spruce dwarf mistletoe on Engelmann spruce on the Fort Apache Indian Reservation, Arizona.

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